Graduate Seminar

&

Student Technical Conference

Tuesday November 29th, 2011

Department of Geodesy and Geomatics Engineering

University of New Brunswick

The organizer would like to welcome you to the

2011 Graduate Seminar & Student Technical Conference

Where:

Head Hall – E11

When:

Tuesday, November 29th 2011

Please join us for refreshments after in room E52.

Seminar Organizer:

Matthew McAdam

with thanks to Sylvia Whitaker

Department of Geodesy and Geomatics Engineering

Geodesy and Geomatics Engineering

Graduate Seminar and Student Technical Conference

09:00AM　　　　　**Opening Remarks**

　　　　　　　　　Chair: Matthew McAdam

Session 1:　　　　**Remote Sensing and Land Management**

　　　　　　　　　Chair: Matthew McAdam

09:10 AM　　　　　Image fusion and 3D information extraction from a very narrow angle set of security cameras

　　　　　　　　　Sina Adham Khiabani

09:30 AM　　　　　Moving Vehicle Extraction from One-Pass WordView-2 Satellite imagery

　　　　　　　　　Rakesh Kumar Mishra

09:50 AM　　　　　An improved approach for soil moisture estimation by employing illumination-corrected data in a modified Ts -VI method

　　　　　　　　　Amer Ahmad

10:10 AM　　　　　Legal liability concerns surrounding Volunteered Geographic Information

　　　　　　　　　Andriy Rak

10:40AM   **Coffee Break**

Session 2:   **Ocean Mapping**

                Chair: Travis Hamilton

10:55 AM   Proper environmental reduction for attenuation for multi-sectors sonars

                Rodrigo Carvalho

11:15 AM   Sector-specific Beam Pattern Compensation for Multi-sector and Multi-swath Multibeam Sonars

                Yun-ta Teng

11:35 AM   Mid-Water Target Detection using Multibeam Water Column

                Carlos Rubrio Marques

12:00 PM   **Closing Remarks**

                Chair: Matthew McAdam

Image fusion and 3D information extraction from a very narrow angle set of security cameras

Sina Adham Khiabani

Department of Geodesy and Geomatics Engineering
University of New Brunswick
P.O. Box 4400, Fredericton, N.B.
Canada, E3B 5A3
Email: S.Adham@unb.ca

Abstract

Finding the 3D location of moving objects inside of a captured scene of a security camera is a useful assistance for better monitoring. Finding 3D coordinates has been a routine process in convention photogrammetry. However, in some applications it is not applicable, cost beneficial or even not possible to use two or several cameras with a large base distance. In our research, a pair of panchromatic and Multi-spectral (MS) cameras has been utilized to produce a high resolution colour images. In order to obtain better fusion quality, the cameras are installed in very narrow angle geometry, to achieve a pixel-size accuracy of co-registration. Under this condition, it is challenging to detect depth information from very limited parallax information. Therefore, this research attempts to explore the potential of depth extraction from the small parallax of a moving object. In this project, an automatic technique has been developed to extract the moving object from both Pan and MS images. By accurate measurement of the gravity centres of the extracted moving objects, it would be possible to estimate the 3D coordinate of the moving object via the scene. Considering that the fusion step will also be performed parallel to the noted functions.

Moving Vehicle Extraction from One-Pass WordView-2 Satellite imagery

Rakesh Kumar Mishra, PhD Candidate

Department of Geodesy and Geomatics Engineering
University of New Brunswick
P.O. Box 4400, Fredericton, N.B.
Canada, E3B 5A3
Email: rakesh.mishra@unb.ca

Abstract

Increasing volume of already-high traffic loads create new challenges for traffic management and planning. A moving vehicle's information (position, speed, and direction) is a key source of information for traffic planning, security surveillance, and military application. Today's road systems are equipped with a suite of sensors for monitoring traffic status, such as induction loops, overhead radar sensors and video sensors. While they all deliver reliable measurements, the results are merely point-based in nature. On the other hand, information provided by remote sensing techniques covers a larger area and thus could often be useful for better understanding the dynamics of the traffic. The high resolution satellite images have been mainly used for this purpose which gives a synoptic view of complex traffic situations and the associated context.

A few attempts have been made to determine vehicle's information using QuickBird satellite imagery. These methods utilize the small time interval between the acquisition of Pan and MS images by QuickBird sensors. However, in these methods, either there is a need to extract vehicle's manually from Pan and MS images or accuracy of vehicle's information extraction is quite low. In order to use high resolution satellite imagery for traffic applications, moving vehicles are needed to be extracted automatically.

The recently-launched high resolution satellite, WorldView-2, has three sensors: one Pan and two MS. Because of a slight time gap in acquiring images from these sensors, the WorldView-2 images capture three positions of a moving vehicle. Furthermore, image resolution of WorldView-2 sensors is slightly better than the QuickBird sensors which improves the accuracy of moving vehicle extraction. In this research work, a new

methodology has been developed to automatically and accurately extract moving vehicles from images captured by the WorldView-2 satellite in one pass. Computation of vehicle's speed and direction is the part of future research work.

An improved approach for soil moisture estimation by employing illumination-corrected data in a modified T_s-VI method

Amer Ahmad

Department of Geodesy and Geomatics Engineering
University of New Brunswick
P.O. Box 4400, Fredericton, N.B.
Canada, E3B 5A3
Email: a1v61@unb.ca

Abstract

There are a great number of publications that apply different methods to estimate soil moisture from optical satellite imagery. However, none of the proposed methods have considered correcting solar illumination error that is caused by variation in topography before estimating soil moisture.

In this research, an integrated approach is developed to improve the estimation of soil moisture. The integration is represented by removing the solar-illumination error from the data. Several modifications were made in the T_s-VI space based on the Universal Triangle Relationship. The data used in the research are obtained from Moderate Resolution Imaging Spectroradiometer (MODIS) satellite.

The research results show that the surface-illumination error, which is caused by variation in topography, misleads the estimation of soil moisture index. Based on statistical and visual analysis, the results are improved with removing the illumination error. The method is further improved with the application of enhanced vegetation index (EVI) to the T_s-VI relationship. The estimation results have not been validated with the in-situ measurements that are taken at the same time as the processed data.

Legal liability concerns surrounding Volunteered Geographic Information

Andriy Rak

Department of Geodesy and Geomatics Engineering
University of New Brunswick
P.O. Box 4400, Fredericton, N.B.
Canada, E3B 5A3
Email: m21kr@unb.ca

Abstract

Authoritative geographic datasets are the source of accurate and reliable data. The process of acquiring, updating and maintaining such datasets using traditional approaches, requires both time and costly resources. An alternative approach, which is more economic, to reliably create and update authoritative datasets is linked to its integration with Volunteered Geographic Information (VGI). Such integration of VGI with authoritative datasets brings about several questions, with legal issues at the forefront. Liability is a primary issue that deter companies from incorporating VGI into their datasets. Due to the lack of research on this topic, companies consider it to be a better practice to exclude VGI as a viable option. If not properly managed, liability has the potential to reduce the importance of VGI before it reaches its' full potential.

This paper will investigate the liability effects of integrating VGI with authoritative datasets. The questions of how and when liability can be exercised are among the most important questions which VGI is now facing and which this paper is aimed to address. Liability issues of using VGI are studied by examining the liability in contract, as well as tort and legislation. Efforts to minimize or eliminate liability generally require organizations to develop a risk management plan. This paper concludes with liability risk management techniques which, if incorporated properly, provide opportunities to minimize or eliminate the liability.

Due to the increasing importance and value that VGI contributes to geographic information science, the need for further research into the VGI field is now emerging. Currently legal liability arising from creation and distribution of VGI has received insufficient attention by the scientific and professional communities. In order to overcome these shortcomings further research on legal issues associated with VGI is required, especially in respect to the liability concerns.

Proper environmental reduction for attenuation for multi-sectors sonars

Rodrigo Carvalho

Department of Geodesy and Geomatics Engineering
University of New Brunswick
P.O. Box 4400, Fredericton, N.B.
Canada, E3B 5A3
Email: x5sjg@unb.ca

Abstract

The rapidly advancing technology has put at the service of contemporary Hydrography more modern equipment, including the new multi-sectors sonars. Those systems are capable of operating simultaneously on different frequencies, often associating CW and FM chirp, dividing their transmit fan in multiple sectors and even in multiple swaths, with the purpose of allowing a sufficient sounding density alongtrack at reasonable vessel speeds, achieving longer range capability and thus reducing ship time surveying.

However, as attenuation is a frequency, temperature, salinity and pressure dependent environmental control, those equipments suffer by different wave absorption in their multiple sectors/swaths, with an impact on the backscattered signals and their products.

While imperfect attenuation coefficient has no effect on bathymetry accuracy, it significantly reduces the value of the backscatter strength. As we move towards more precise calibration of backscatter strength to get additional information about the nature of the seafloor, such as bottom type or bottom micro roughness and their respective lateral and temporal homogeneity, the requirement for precise attenuation coefficient is increasingly important.

The need for better calibrated acoustic backscatter strength estimate is driven by operational needs in environmental monitoring, oil field development and defense applications.

Sector-specific Beam Pattern Compensation for Multi-sector and Multi-swath Multibeam Sonars

Yun-ta Teng

Department of Geodesy and Geomatics Engineering
University of New Brunswick
P.O. Box 4400, Fredericton, N.B.
Canada, E3B 5A3
Email: w8jgc@unb.ca

Abstract

Increasingly, multibeam sonar systems are using multi-sector and multi-swath to improve the resolution of seabed survey. These systems provide not only bathymetry but also seafloor backscatter products. The proper calibration of seafloor backscatter is very important and the use of multiple sectors complicates the approaches and applications to achieve sediment classification.

With the addition of sectors and multiple swaths number, the apparent seafloor backscatter is overprinted with artefacts generated by variations in the power and beam pattern of each sector, the frequency dependent propagation in the ocean (absorption attenuation), and frequency dependence reflection of the seafloor (angular response). Current backscatter output from these systems is not properly reduced to correct for these artefacts.

This thesis is mainly to illustrate the problems and solutions of beam pattern residual artefacts in backscatter images which are using Kongsberg EM2040, EM710, EM302 and EM122 systems all of which are both multi-sector and multi-swath. The benefits of software developed as part of this research are illustrated through examples of data improvement that utilize the new OMG beam pattern correction software developed herein.

Mid-Water Target Detection using Multibeam Water Column

Carlos Rubrio Marques
Department of Geodesy and Geomatics Engineering
University of New Brunswick
P.O. Box 4400, Fredericton, N.B.
Canada, E3B 5A3
Email: i460d@unb.ca, crubrio@hotmail.com

Abstract

With the continuing evolution of multibeam systems, as well as bathymetry and backscatter, water column imaging is now routinely available. Although, the use of water column for fisheries, oceanographic imaging and several other areas is well established, a step further can be achieved with the recognition and precise location of mid-water targets.

The pattern of the scattering field around a point target is directly related to the multibeam imaging geometry, including transmission and reception beam widths, sidelobe patterns, transmission sectors and slant range. Knowing that and using the range, vertically-referenced angles and sound speed structure for refraction, individual hardly-perceptible targets can be discriminated, making it possible to pick them out from noise its location can be obtained with the same positioning uncertainty that we already associate with depth.

This object detection can be achieved by the trained operator when carefully inspecting all the data, but is a very long and tiresome task, with a high potential for making mistakes. Automatic algorithms can be developed to perform this task, as well as tracking the object's movement. These new capabilities can be used in oceanographic research, in search and rescue, also for military purposes, and to track geological activity. A specific case study used as an example is the monitoring of suspended targets over seabed markers that are progressively displaced by landslides.